

The Chronological and Spatial Relationships of Ceremonial Architecture: Seriation of *Marae*

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INTRODUCTION

In 1933 Kenneth Emory, one of the pre-eminent archaeologists in the Pacific, published "Stone Remains in the Society Islands." Here Emory presented data on several hundred stone structures, called *marae* that were located across the Society archipelago in the center of the Pacific. Emory's research opened the door to the archaeological study of stone architecture (e.g., Cristino et al. 1988; Descantes 1990, 1993; Emory 1933, 1943, 1970; Emory and Sinoto 1965; Garanger 1969; Graves and Cachola-Abad 1996; Graves and Sweeney 1993; Green et al. 1967; Kirch 1990; Kolb 1992; Martinsson-Wallin 1994; Sinoto 1996; Stokes 1991; Verin 1961; Wallin 1993) and archaeologists have spent the last 60 years analyzing the *marae* complex in the Society Islands.

Much of this research has focused on behavioral interpretations of *marae* as ceremonial architecture, both in the development of *marae* forms over time and the differences in *marae* across space. Ethnohistoric texts (e.g., Cook 1832; Ferdon 1981; Henry 1928) are a vital source of information in this effort and contain accounts of *marae* that were constructed to inaugurate chiefs, claim territories, and propitiate deities. Regardless of why *marae* were constructed, homologous or stylistic similarity in various aspects of their form through time and space results from interaction between the groups of people that built *marae*.

Chronology building is the necessary first step to explaining changes in the interaction dynamics of such prehistoric groups. Previous chronologies of *marae* (Descantes 1990, 1993; Emory 1933; Green et al. 1967; Sinoto 1996) often suffer from classification ambiguities and temporal imprecision as they were mostly developed from ethnohistoric data and radiometric techniques. The assignment of *marae* to particular groups is not governed by explicitly defined criteria, nor is there evidence that any one group of *marae* maintains temporal uniqueness relative to other groups.

The seriation method offers a solution to these problems.

The theoretical foundation and related classification requirements of the method generate expectations for the distribution of stylistic architectural traits. Because seriation is a set of goal-directed propositions derived from a larger theoretical framework, that framework can be used to investigate analytical concerns such as a seriation's temporal precision, the conflation of superficially similar artifact classes, and the comparison of geographically distinct seriations.

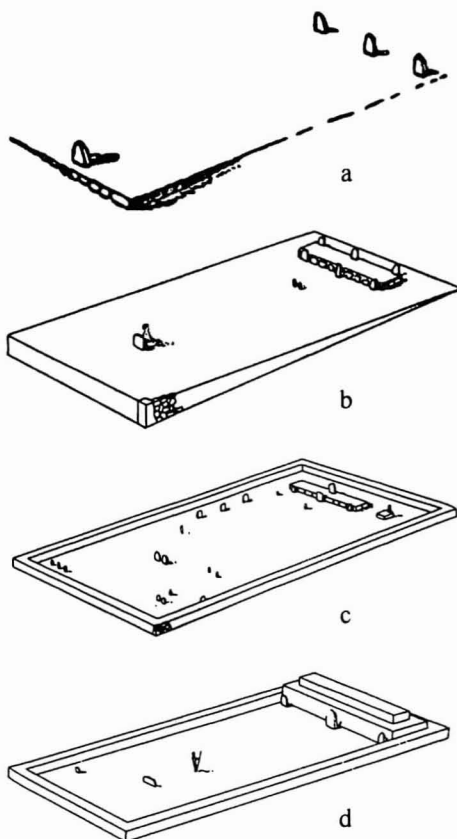
Stylistic similarity not only indicates chronological relationships, but spatial relationships as well. Recently, archaeologists have begun to explore the spatial component of stylistic traits ordered by seriation (Graves and Cachola-Abad 1996; Lipo et al. 1997). Tentative conclusions suggest it is possible to map, in a sense, the spatial distribution of interacting groups, noting their divergence and convergence over time.

Here I present seriations of Society Islands' *marae* at various levels of temporal precision and geographic inclusiveness. With these seriations I add to the knowledge of the archipelago's prehistory, as well as explore methodological issues in seriation, highlighting the reasons why seriation remains an important tool for archaeologists.

SERIATION OF *MARA*E: CLASSIFICATION ISSUES

Even before Emory, scholars working in the Pacific suggested that architectural forms change over time (Fornander [1875-1885] 1969; Stokes 1991). To develop this general notion into an analytical program I follow the lead of Graves and Cachola-Abad (1996) and use object-scale occurrence seriation to arrange *marae* in inferred chronological sequences. For object-scale occurrence seriation each object is classified by the presence or absence of various traits or dimensions. Objects are then placed in a

relative order that maximizes presence and absence continuity across dimensions. Such an arrangement of objects is predicated by the empirical generalization that describes the distribution of any historical or temporal class as continuous through time (Dunnell 1970:308).



Examples of some typical *marae* structures:
a) a simple shrine without an *ahu*,
b) *ahu* with three uprights on the *ahu* as well as along the face, on a raised court;
c) *ahu* with one upright on the *ahu* and three along the face, in a court enclosed by a low wall;
d) *ahu* with three steps and uprights along the face, in a court enclosed by a low wall (from Emory 1933).

The first step in classifying *marae* for seriation is to determine which objects, out of a morphologically diverse array of stone structures are *marae*. Defining the analytical field, as it is called, is not a simple semantic exercise—for when using seriation to derive chronological or spatial conclusions from the distribution of stylistic traits across a set of objects, the objects must participate in the same stylistic trajectory.

It follows that the inability to seriate a given set of objects may indicate that more than one stylistic trajectory is represented. Although I will not discuss them here, seriations combining *marae* with small interior platforms, *ahu*, and *marae* without *ahu* are uniformly unsuccessful compared to separate seriations ordering each kind of structure.¹

Thus, for this analysis, I have narrowed the field of *marae* to include any stone structure with the following two elements: (1) a quadrilateral area separated from the surrounding landscape by walls, stones or any other border; commonly called a courtyard, and (2) within or partially upon the boundaries of the courtyard, a smaller quadrilateral area with a perimeter that separates it, either raised, lowered, or level, from the courtyard; commonly called an *ahu*.

Once a field has been determined, the traits or dimensions used to classify individual *marae* must be defined. Employing a "trial and error" approach to classification, as described by Teltser (1995) I examined traits that were applicable to all *marae* in the archipelago, could be combined in any fashion, and for which there seemed to be an appreciable amount of variability. Four traits are used to classify Society Islands' *marae*. All *marae* examined were classified by the presence or absence of (1) walled perimeter sections, (2)

Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights	Temporal Unit
106, 116	●				6
118, 115, 112	●		●		5
105	●		●	●	4
89, 90, 92	●			●	3
104, 93		●		●	2
111, 110, 109		●			1

Figure 1. Seriation of *marae* from Tautira, Tahiti. *Marae* numbers in all seriation figures refer to Wallin's (1993) identification.

Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights	Temporal Unit
196	●		●		D
199	●		●	●	C
201, 203, 205, 207, 187, 191	●			●	B
188		●		●	A

Figure 2. Seriation of *marae* from Teaharoa, Mo'orea.

Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights	Temporal Unit
27, 51, 52, 16, 75, 106, 116	●				7
64, 66, 17, 43, 118, 115, 78, 112, 119, 63, 196	●		●		6
211, 199, 65, 60, 41, 42, 45, 46, 105, 199	●		●	●	5
89, 90, 92, 50, 53, 26, 191, 201, 203, 205, 207, 187, 31-33, 65, 69	●			●	4
30, 35	●	●		●	3
104, 93, 38, 188, 39		●		●	2
111, 72, 110, 109, 44, 21, 18, 20, 59		●			1

Figure 3. Seriation of *marae* from districts on Mo'orea and Tahiti.

unwalled perimeter sections, (3) an *ahu* that is physically connected to the *marae* perimeter, and (4) the placement of upright stones in the courtyard. Textural sources (Cristino et al., 1988; Emory 1933; Emory and Sinoto 1965; Garanger 1964, 1980; Green et al., 1967; Verin 1961) provided the raw data for *marae* classification with Wallin's recent (1993) *marae* compendium proving the most exhaustive. Given the nature of taphonomy and the differences in data presentation between researchers, it was possible to classify 253 of the 444 *marae* in the total Society Island's assemblage (Wallin 1993) using the four traits listed above.

SERiations OF MARAE: INITIAL ATTEMPTS AT CHRONOLOGY

Once classified, *marae* were placed into seriation orders by combining *marae* from the smallest common geographic unit. Valley-scale provenience proved the most instructive in constructing initial orders. Additional *marae* from larger geographic units (e.g., adjacent valleys, and larger, political districts) were added until there was a discontinuity in the presence/absence distributions of one or more traits. As others have remarked gaps in trait distributions caused by sampling errors most likely occur at the tails of distributions (Dunnell 1970; 1981). Substantial gaps in presence/absence distributions, however, force the removal of offending traits from the order and results in a lessening of precision as larger geographic areas are included in a single seriation.

The island of Tahiti was divided into numerous political districts extant at European contact. Fourteen *marae* from the district of Tautira in eastern Tahiti are successfully ordered in an occurrence seriation (Figure 1). The column on the left of

the seriation lists the *marae* by rows, where each row defines a unique *marae* class. In the four trait columns, "Walled", "Unwalled", "Perimeter Ahu," and "Uprights" a black circle indicates the presence of that trait. Lastly, each row or *marae* class defines a temporal unit. Before accepting this order as chronological, however, the effect of space on the transmission of stylistic traits must be examined. A seriation from a neighboring island will help to explore this issue.

On the island of Mo'orea, approximately 20 kilometers west of Tahiti, another successful seriation of nine *marae* from the central district of Teaharoa can be constructed (Figure 2). The Teaharoa seriation contains only four hypothetical temporal units, A-D, as displayed in the seriation in Figure 2. Notice that the temporal units in the Teaharoa seriation are defined by identical *marae* classes as temporal units 2-5 in Tautira. Both sets of temporal units are in the

same relative order as well. The distance between the Tautira and Teaharoa districts, situated on opposite sides of adjacent islands, suggests that their identical seriation orders are predominantly tracking change through time in each district and not change across space between them.

The temporal direction of these orders has not yet been established. In Tautira, *marae* 105 abuts *marae* 104 and superpositional evidence indicates that *marae* 105 was built after *marae* 104. This relationship is also reflected in the Tautira seriation order; *marae* 104 occurs in temporal unit 2, while *marae* 105 occurs later in temporal unit 4. Additionally, *marae* with historic construction dates at the top of the Tautira seriation suggest that the top is the more recent end. Radiocarbon dates associated with three Tautira *marae* (Garanger 1969) are of little help as they all occur in the third temporal unit and have standard deviations that date them from the 1500s to the present.

Obviously, it is possible to combine the *marae* from

Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights
16, 27, 51, 62, 16, 134, 135, 137, 138, 144, 75, 106, 116	●			
64, 66, 17, 43, 118, 118, 78, 112, 119, 63	●		●	
11, 55, 60, 41, 42, 45, 46, 105	●		●	●
89, 90, 4, 92, 65, 69, 60, 53, 26, 31-33	●			●
<hr/>				
132, 129	●	●		
133, 147, 30	●	●		●
14	●	●	●	●
35	●	●		●
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67, 8		●	●	●
104, 93, 15, 38, 39, 143, 131		●		●
111, 72, 110, 109, 44, 21, 18, 20, 59, 6, 9, 10		●		

Figure 4. Seriation of *marae* from all districts in Tahiti. Horizontal lines are hypothetical temporal divisions based on the traits "walled" and "unwalled."

these two districts into a single seriation without any loss of precision. We might expect that *marae* from a more inclusive area may be successfully added as well. The seriation (Figure 3) combines *marae* from the Teaharoa district on the island of Mo'orea with all *marae* from Tahiti except for two clusters of Tahitian districts in the northwest portion of the island; an interesting omission to which I return below. This seriation as well orders *marae* predominantly along a temporal axis. There are seven temporal units and the sequence of *marae* classes which define them are identical to those from Tautira and Teaharoa with the addition of one more *marae* class, that of temporal unit 3. Lastly, this seriation and the previous ones document the chronology of *marae* construction for a large part of the islands of Tahiti and Mo'orea showing that the earliest *marae* were unwalled structures with different architectural elements added and omitted over time.

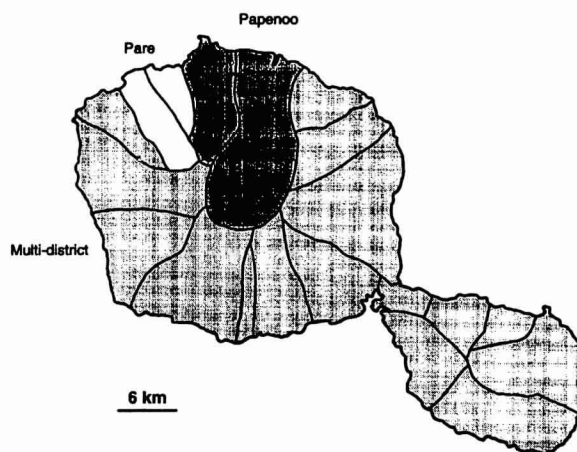


Figure 5. The spatial extent of *marae* grouped in three seriations. Similar shading indicates that the *marae* included in this space are grouped in a seriation.

Given that a quite precise chronology of *marae* from a large part of two islands can be constructed, the question occurs: what happens when larger geographic units are seriated? Attempting to seriate all *marae* from Tahiti (Figure 4) demonstrates the effect of compounding spatial and temporal variability in a single seriation. The inclusion of two clusters of districts from the northwest corner of the island causes the multiple gaps in this seriation. The order can be divided into three hypothetical temporal units (marked by the horizontal lines) based only on the first two traits. The usefulness of such a gross and uncertain measure of temporal change is minimal relative to seriations with more than double the number of *marae* classes. This relationship between precision and geography plays out in seriations at various scales throughout the Societies. Seriating the Leeward islands as a group also produces three temporal units based on only two traits, while seriating all 253 classifiable *marae* across the archipelago gives the same result.

BEYOND CHRONOLOGY: COMPARING THREE SERIATIONS

Chronology is not, of course, the only concern of archaeologists and seriation need not be used solely as a chronological tool. As the preceding seriations suggest, there is differen-

Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights	Temporal Units
27, 61, 82, 16, 75, 106, 116	●				7
64, 66, 17, 43, 118, 115, 78, 112, 119, 63	●		●		6
55, 60, 41, 42, 45, 46, 105	●		●	●	5
89, 90, 92, 50, 53, 26, 31-33, 65, 69	●			●	4
30, 35	●	●		●	3
104, 93, 38, 39		●		●	2
111, 72, 110, 109, 44, 21, 18, 20, 59		●			1

Figure 6. Seriation of *marae* from the largest geographic grouping ("multi-district") in Tahiti.

tial interaction across space in the Society Islands. Occurrence seriation of *marae* is particularly well suited for analyzing the structure of prehistoric group interaction. As stationary fixtures, individual *marae* localize the spatially bound expression of ideas about stylistic architectural traits. By mapping the geographic extent of contemporaneous *marae*, a map of the spatial extent of ideas common to a group of people is also created. Seriations from Tahiti illustrate this point.

Given the four traits used in classification, Tahitian *marae* must be grouped into three geographic sets (Figure 5) to produce seriations of maximum precision. These three sets include the *marae* in one large, multi-district area encompassing most of Tahiti, and two clusters of districts in the northwest corner of the island. Generalizing across the history of *marae* building on Tahiti, the boundaries of these three areas define the spatial extent of interaction groups where within-group interaction exceeded between-group interaction.

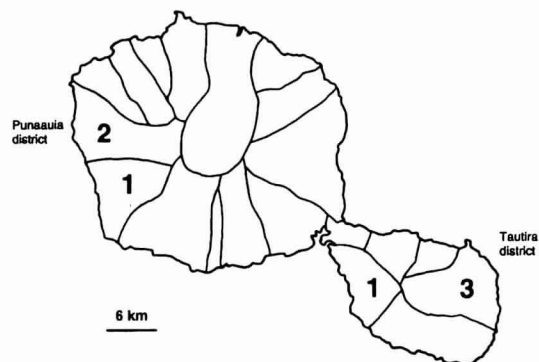


Figure 7. Spatial distribution of *marae* in the first temporal unit of the "multi-district" seriation (Figure 6). Numerals indicate numbers of *marae* for each district.

The boundaries of these groups change, of course, according to the level of classification. A pan-island seriation (see Figure 8) maintains continuity in only the first two traits and suggests that Tahiti constitutes a single interaction area with three temporal units. However, using only the first two traits to classify Society Island's *marae* there is no differentiation in group interaction across the entire archipelago. The current level of precision balances sample-size considerations, and the ability to say something interesting about Society Island's prehistory (instead of the vacuous statement that "in

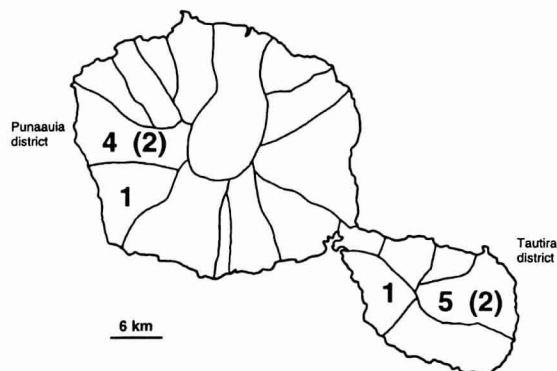


Figure 8. Spatial distribution of *marae* in the second temporal unit of the "multi-district" seriation (Figure 6). Numerals indicate total number of *marae* for each district. Numerals in parentheses indicate number of new *marae* for this temporal unit.

prehistory, the people of the Society Islands tended to share ideas about *marae*").

Coincidentally, according to ethnohistory, the two clusters of districts in the northwest corner of Tahiti did not interact equally with the rest of the island. The district of Pare housed the political center of the island, while the other cluster contains the district of Papen'o'o, possibly used as a penal colony or haven for people who had broken taboo. Furthermore, the inclusion of the rest of Tahiti in a single interaction group contradicts what many scholars would predict. People inhabiting the small volcanic cone of eastern Tahiti (Tahiti Iti) engaged in a bitter and bloody rivalry with the rest of the island (Henry 1928). Most of western Tahiti, however, seems to have interacted with the east to a greater degree than with the island's seat of political power in the district of Pare.

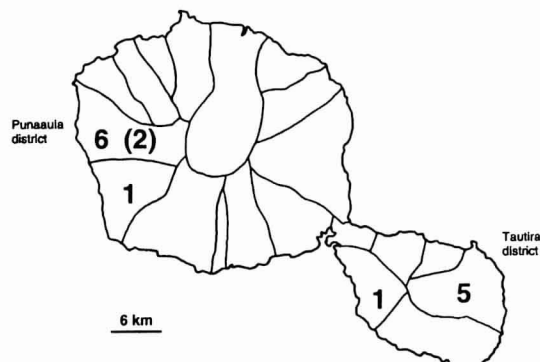


Figure 9. Spatial distribution of *marae* in the third temporal unit of the "multi-district" seriation (Figure 6). Numeral legend is the same as Figure 8.

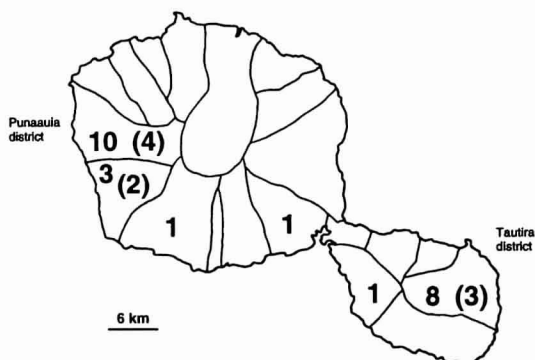


Figure 10. Spatial distribution of *marae* in the fourth temporal unit of the "multi-district" seriation (Figure 6). Numeral legend is the same as Figure 8.

BEYOND CHRONOLOGY: MAPPING CONTEMPORANEOUS *MARAE*

In a complementary approach, examining the spatial distribution of *marae* in succeeding temporal units of a single seriation uncovers the temporal structure of group interaction. A seriation of the large, multi-district area encompassing most of Tahiti (Figure 6) is the most geographically inclusive and contains 7 temporal units. *Marae* on Tahiti are generally affected by similar taphonomic processes so the distribution of *marae* across space in successive temporal units tracks the spread of interaction. In Figure 7 the district locations of the five *marae* in the earliest temporal unit are depicted. Not surprisingly, *marae* first appear in the areas that have the longest settlement history. This pattern continues in the location of added *marae* in the second temporal unit (Figure 8). Both the districts of Punaauia to the west and Tautira to the

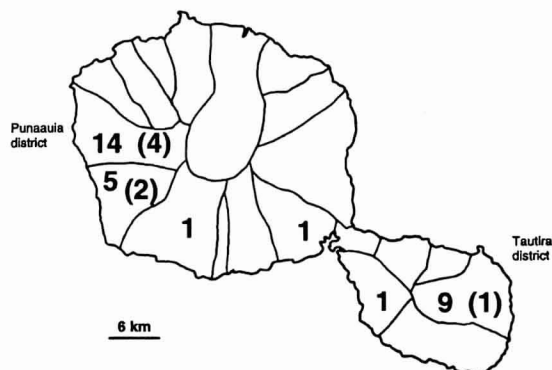


Figure 11. Spatial distribution of *marae* in the fifth temporal unit of the "multi-district" seriation (Figure 6). Numeral legend is the same as Figure 8.

east construct more *marae*. Two additional *marae* are added to Punaauia in the third temporal unit (Figure 9). In the fourth temporal unit, *marae* are built in districts surrounding Punaauia and Tautira, while these two districts continue to add *marae* (Figure 10). In the fifth temporal unit the districts along the western coast of Tahiti add six *marae* compared to one additional *marae* built in Tautira (Figure 11). *Marae* construction spreads across a greater portion of Tahiti in the sixth temporal unit with additional districts in the east and west adding *marae* (Figure 12). Finally, in the most recent

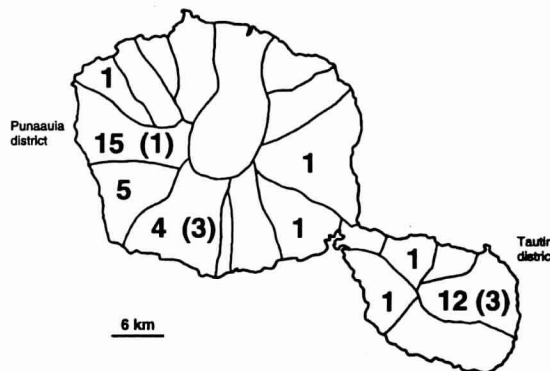


Figure 12. Spatial distribution of *marae* in the sixth temporal unit of the "multi-district" seriation (Figure 6). Numeral legend is the same as Figure 8.

temporal unit, four more *marae* are added to western districts, while a single district in the east, again Tautira, adds two more *marae* (Figure 13).

Mapping the spatial distribution of contemporaneous *marae* in succeeding temporal units of a single seriation reveals the changing scale of interaction. The inclusion of Tautira and Punaauia in a single seriation indicates that they interacted, at least through the medium of *marae* architecture. After examining the spatial distribution of *marae* in sequential temporal units a clearer picture of the space-time structure of that interaction emerges. Additionally, the rivalry between east and west documented in ethnohistory is now more compelling considering recent research that analyzes ceremonial architecture within the framework of competitive advertising (Neiman 1995) and political aggression (Graves and Lade-foged 1995). This diachronic analysis of only one portion of

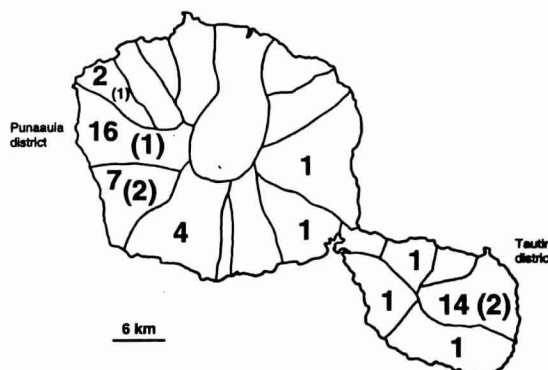


Figure 13. Spatial distribution of *marae* in the seventh temporal unit of the "multi-district" seriation (Figure 6). Numeral legend is the same as Figure 8.

Tahiti, however, presents a lopsided view of the island's prehistory. It may be still possible to integrate the separate seriations of different areas.

BEYOND CHRONOLOGY: TRACKING DIVERGENCE IN INTERACTION

Comparing seriations of the Pare district of northwestern Tahiti and the multi-district seriation may establish the relative time when these two areas began to diverge into separate interaction groups. In Figure 14, the Pare district seriation (to

MULTI-DISTRICT SERIATION					PARE DISTRICT SERIATION						
Marae Number	Walled	Unwalled	Perimeter Ahu	Uprights	Temporal Units	Temporal Units	Walled	Unwalled	Perimeter Ahu	Uprights	Marae Number
27, 51, 52, 1A, 75, 106, 116	●				7						
64, 66, 17, 43, 118, 115, 78, 112, 119, 63	●		●		6	6	●			●	4
55, 60, 41, 42, 45, 46, 106	●		●	●	5*	5*	●		●	●	11
89, 90, 92, 50, 53, 26, 31-33, 65, 69	●			●	4	4	●	●	●	●	14
30, 35	●	●		●	3	3		●	●	●	8
104, 93, 38, 39		●		●	2*	2*		●		●	15
111, 72, 110, 109, 44, 21, 18, 20, 59		●			1*	1*		●			Δ, 9, 10

Figure 14. A comparison of the multi-district and Pare seriations. Temporal units with asterisks share identical marae classes in each seriation.

the right) and the multi-district seriation (to the left) exhibit 6 and 7 temporal units, respectively. However, the *marae* classes that define temporal units 3, 4 and 6 in the Pare seriation do not exist in the multi-district seriation. Despite these differences, the two earliest temporal units of the Pare seriation are defined by identical *marae* classes as the two earliest temporal units of the multi-district seriation. This suggests that in these two earliest temporal units the Pare district interacted equally in the exchange of ideas about architecture with the other districts on Tahiti. By temporal unit 3, quite early in the overall sequence of *marae* building, this interaction may have declined, with two or three interaction groups possibly emerging. Temporal unit 5 however, is defined by identical *marae* classes in each seriation and may suggest, that there was interaction at a currently undefinable level between the two areas throughout prehistory.

CONCLUSIONS

Seriation is an archaeological tool with incredible analytical potential. Because the seriation method is grounded in a theory built to explain the differential representation of transmittable traits, the method can be used to examine an array of topics based in group interaction, both chronological and spatial. Here, object-scale occurrence seriation is used to develop chronologies by ordering constituent architectural traits of *marae*. Chronology was inferred by first noting similar directionality of orders in spatially distinct groups of *marae*; second, by invoking independent superpositional relationships between *marae*; and third, by recourse to historic records. At their most precise level, these seriations offer far more information than radiocarbon dating.

Chronology building is, of course not an endpoint in archaeology, but rather the beginning of most analyses. Seri-

ation can also be used to examine differing levels of group interaction, exemplified with an analysis of interaction on the island of Tahiti. A tri-partite interaction structure on the island of Tahiti was demonstrated by mapping the spatial extent of *marae* included in three maximally precise seriations. A closer look at diachronic interaction in the multi-district area was also offered. Finally, a comparison of the multi-district seriation and the seriation of the Pare district suggests a developmental sequence in their interaction history, including divergence into two, or more, interaction groups. Seriation can be used to produce such general knowledge of prehistoric group interaction—knowledge that is a foundation for subsequent analyses.

Looking beyond the Society Islands we see similar architecture throughout Polynesia. Data suggest (Graves and Sweeney 1993) that the *tohua* of the Marquesas, 1500 kilometers to the northeast of the Societies, are functionally similar artifacts and could be analyzed in conjunction with *marae*. The *heiau* of the Hawaiian Islands, 4500 kilometers to the north and the *ahu moai* of Easter Island as well could likely be included in a pan-Polynesian analysis. Seriation of ceremonial architecture throughout Polynesia and the Pacific may indeed help to answer some of the region's most enduring questions of inter-archipelago interaction, the timing of colonization, and the role of ceremonial architecture in the social structure of Pacific prehistory.

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FOOTNOTE

¹ A more detailed analysis (Cochrane 1997) suggests that the inclusion of different functional types of stone structures (e.g., *marae* with and without *ahu*; cf. Descantes 1993) in a single seriation confounds attempts to explain the temporal and spatial distribution of the structures.

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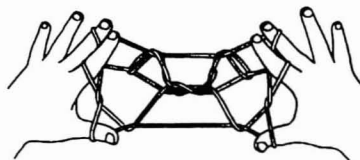
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